

N
C
E
P

EMC Use of 88D Observations

Present and Future

Geoff DiMego

Geoff.DiMego@noaa.gov

21 May 2002

Where the Nation's climate and weather services begin

Topics

- Current use of 88D data
- Assimilation Options For Level II
- Issues in Using Level II

Current Use of 88D

- VAD wind profiles from Radar Coded Messages
- Precipitation Estimates from River Forecast Center data collection
- Radial Velocity from NWS NIDS Replacement multi-cast

Intermediate Upgrade to Winds

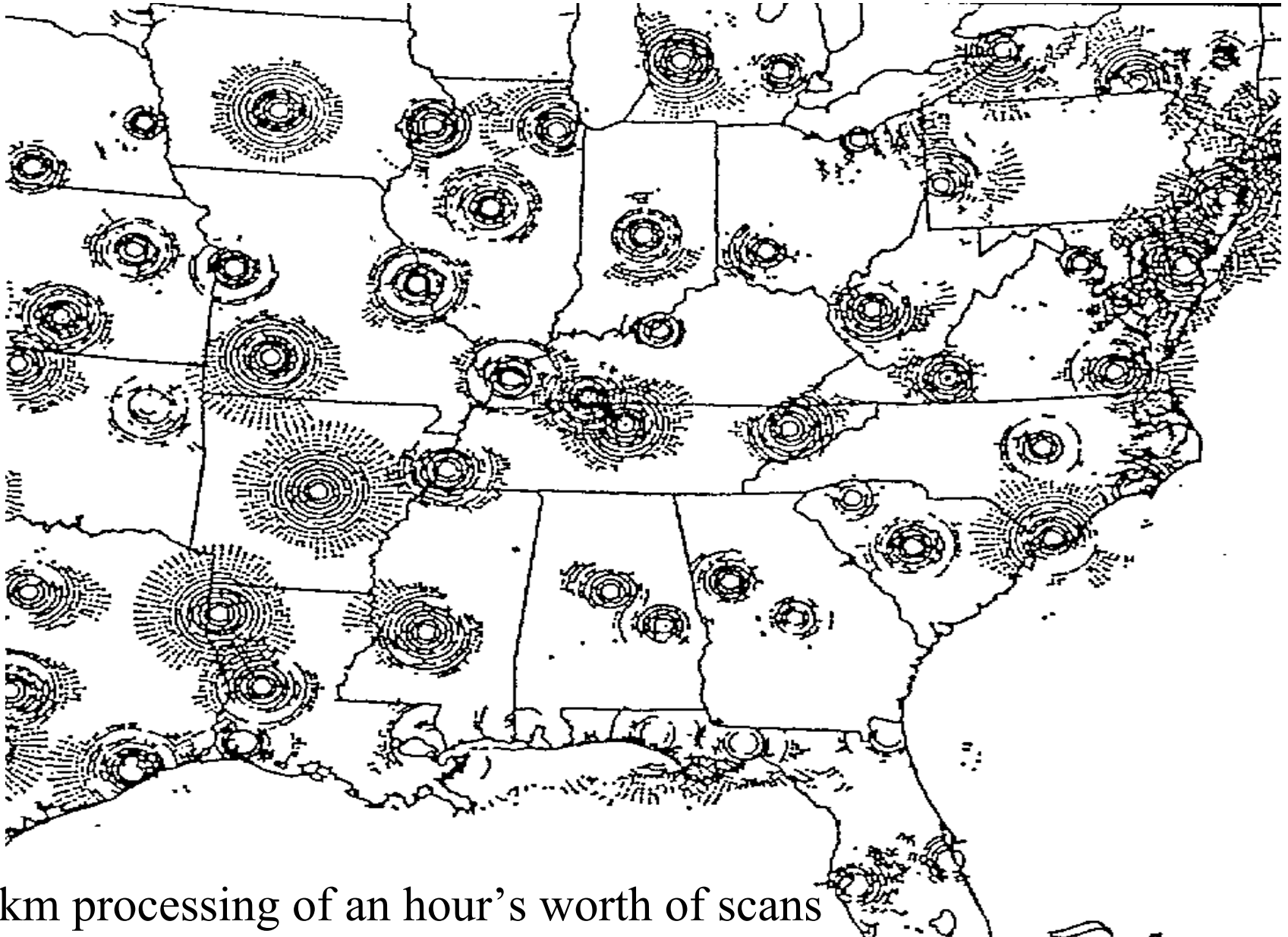
- Super-obbing to be performed on-site from full resolution data
 - Transmit super-obs
 - All tilts
 - Part of Open RPG
- Overcomes lack of precision in current feed of NIDS radial velocities
- Still need Level II for WRF era

Mesoscale Model and Assimilation Resolution

- November 2001 - 12 km continental runs with Meso Eta
- June 2002 - 8 km window runs with Nonhydrostatic Meso
- November 2003 - 10 km continental runs with Meso Eta
- June 2004 - 6 km window runs with WRF
- November 2005 - 8 km continental runs with WRF
- June 2006 - 4 km window runs with WRF
- Physics and assimilation upgrades as often as every Spring and Fall

In 2002, 3DVAR will use 88D Radial Velocity

Sample Distribution



~ 5 km processing of an hour's worth of scans

Assimilation Options for Level II

- 3DVAR obs used as point values ala Derber (using adjoint of forward model)
 - Radial velocity is straightforward
 - Reflectivity is complicated
 - Spectral width ???????????
- Super-obbing with higher moments ala Purser
- Parrish technique uses data as “constraint” to analysis

Assimilation Options For Level II

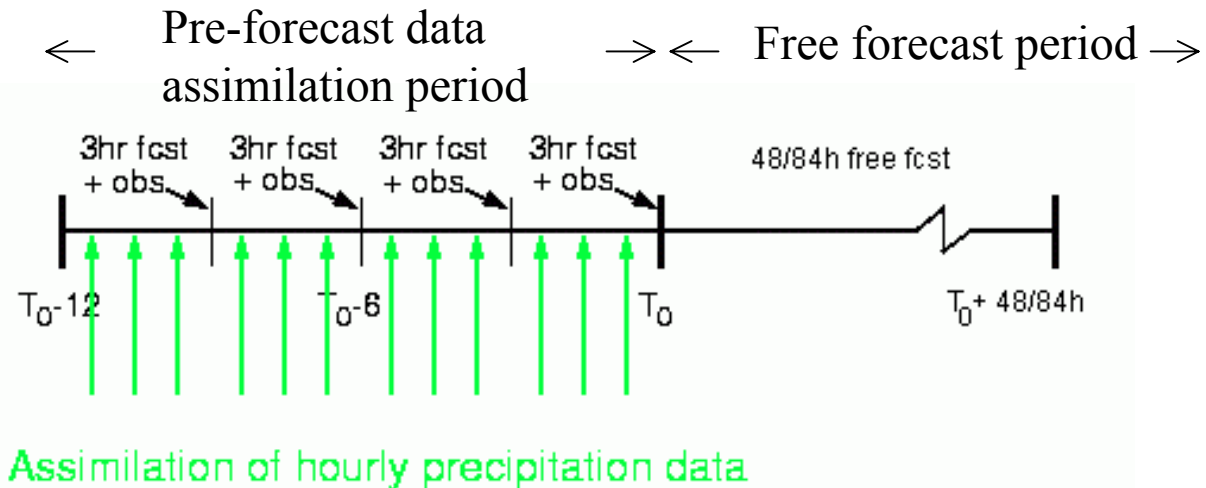
- 4DVAR ala Crook/Sun or Qin Xu
 - Computationally expensive
 - Dependent on “model” errors
- Retrievals ala OSU ADAS
 - Violates the Derber DOGMA
 - Adds more sources of error
 - Observation error is even more difficult to define
 - Require additional information (assumptions etc) to solve the ill-posed problem

Issues in Using Level II

- Specification of observation error
 - Clear versus disturbed conditions
 - Distance from site
- Inter-calibration between sites
- Site specific quality control
- Beam geometry
- Representativeness
 - Return from only part of the beam
 - Scale mismatch with model

Background Slides

Precipitation Assimilation Method



In the forecast period between the analysis steps of the 12h pre-forecast data assimilation period, at each time step and at each point where observed precipitation is available, we compare P_{mod} to P_{obs} , then modify the model's temperature, moisture, cloud and rain field to be more consistent with observed precipitation.

Assimilation of observed precipitation

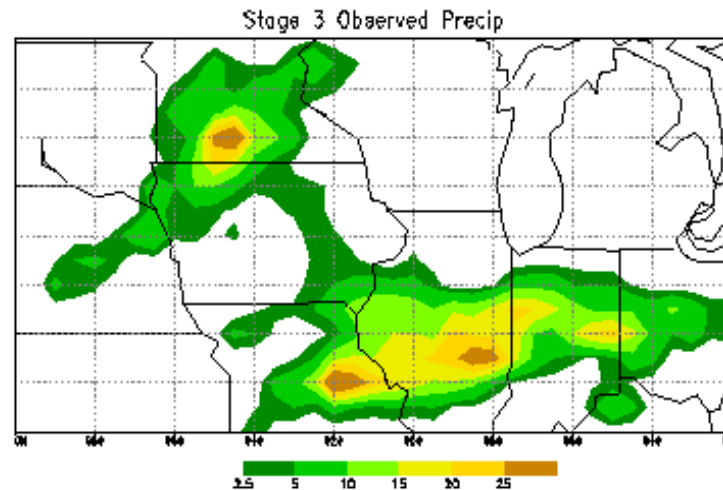
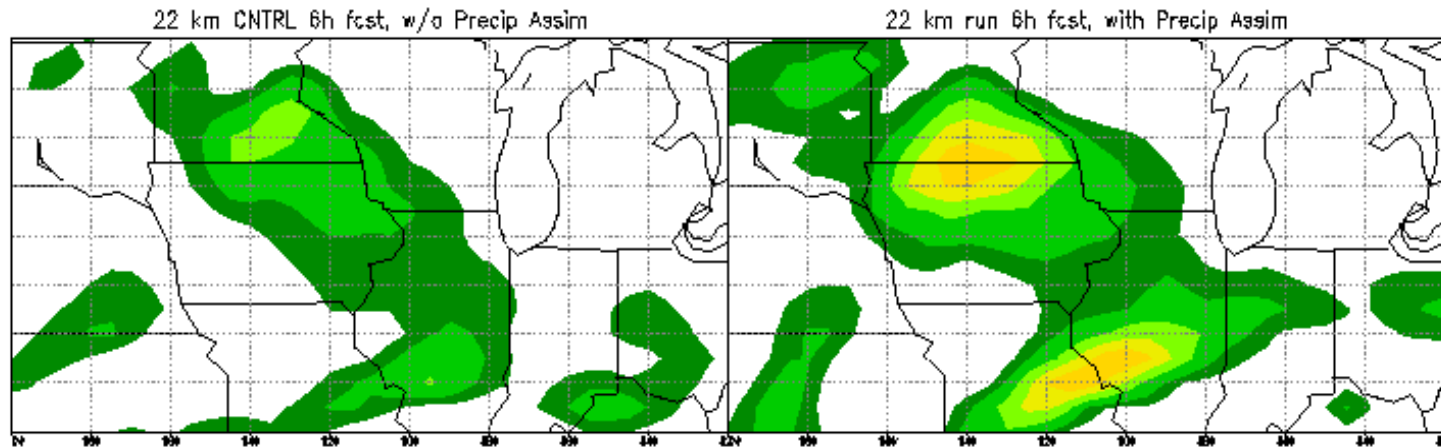
<http://www.emc.ncep.noaa.gov/mmb/papers/lin/pcpasm/paper.html>

- During the 12h pre-forecast assimilation period at each timestep compare the model predicted rainfall to observed
- Adjust the model's latent heating profile (Carr&Baldwin, 1991), moisture and cloud accordingly

$P_{obs} = 0$	<ul style="list-style-type: none"> • Set P_{mod} to zero; • Adjust latent heating profile accordingly; • Adjust q_v so RH stays unchanged. 	No adjustment needed.
$P_{obs} > 0$	<ul style="list-style-type: none"> • Multiply model's latent heating profile by P_{obs}/P_{mod}; • Adjust q_v so RH stays unchanged. 	<ul style="list-style-type: none"> • Specify a vertical extent of cloud layer based on P_{obs}; • Specify a parabolic latent heating profile; • Set RH in cloud layer to 90%.
	$P_{mod} > 0$	$P_{mod} = 0$ Or $P_{mod} \ll P_{obs}$

Improvement on 6h Precipitation Forecast

6h Precip Accum (mm) 06Z 11 Apr 2001



Current Nested “HiResWindow”

- Runs after AVN in production suite
- Initial conditions
 - Interpolated from 12 km Meso Eta
 - Higher resolution terrain incorporated
 - Lynch digital filter speeds adjustment
- Lateral boundary conditions (out to 48 hours)
 - Generated by 12 km Meso Eta
 - Every hour of forecast
 - On model vertical levels

In 2002 HiRes Window Nests Will Be 8 km and Use Janjic Nonhydrostatic Meso Model with Hybrid Sigma-Pressure Vertical Coordinate

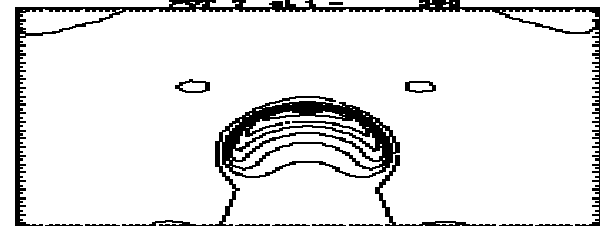
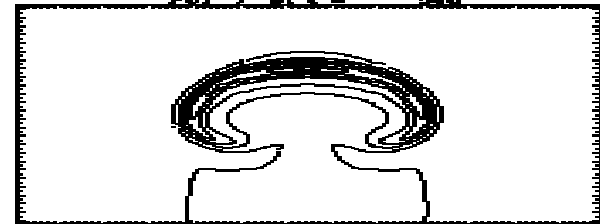
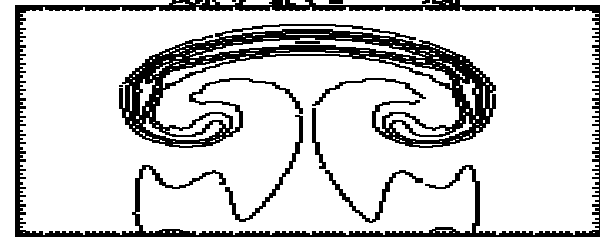
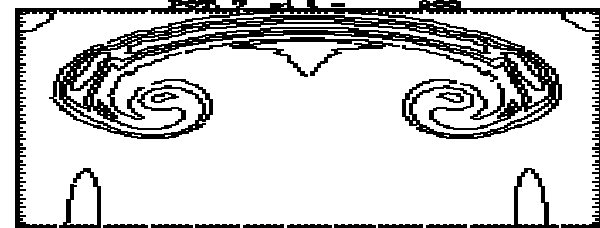
Cold Bubble Test

t
↓



Warm Bubble Test

↑
t



HiRes Window Fixed-Domain Nested Runs

- Users want routine runs they can count on at the same time every day
- 00Z : Alaska-10 & Hawaii-8
- 06Z : Western-8 & Puerto Rico-8
- 12Z : Central-8 & Hawaii-8
- 18Z : Eastern-8 & Puerto Rico-8
- This gives everyone a daily high resolution run when no hurricane

